

Lightweight, Advanced Sorbent-Based Device to Collect and Pressurize CO₂ from Martian Atmospheres, Phase I

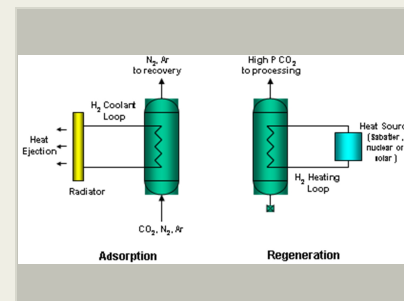
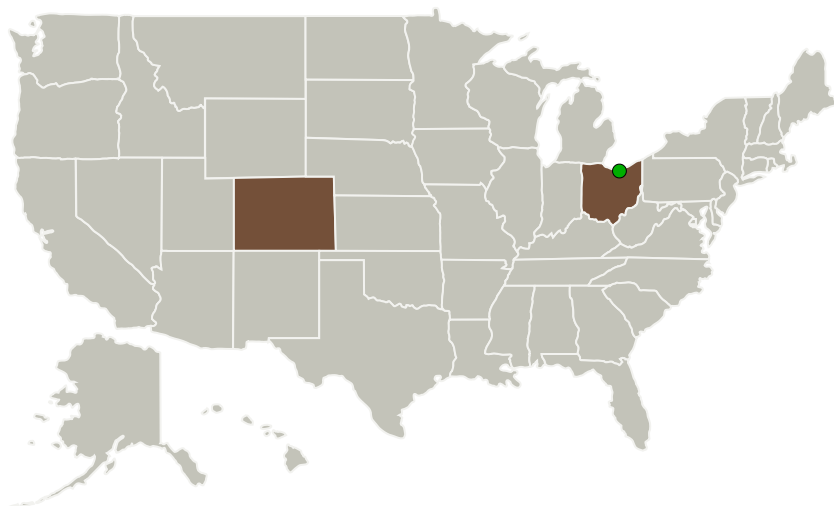
Completed Technology Project (2014 - 2014)



Project Introduction

Human exploration of Mars, as well as unmanned sample return missions can benefit greatly from use of propellants and life-support consumables produced from the resources available on Mars. The first major step of any in-situ propellant production system is the acquisition of carbon dioxide from the Mars atmosphere and its compression for further chemical processing. TDA Research Inc. proposes to develop a compact, lightweight, advanced sorbent-based compressor to recover high-pressure, high purity CO₂ from the Martian atmosphere. The system eliminates the need for a mechanical pump, increasing the reliability with relatively low power consumption. TDA's system uses a proprietary sorbent that selectively adsorb CO₂ at 0.1 psia and regenerates by temperature swing, producing a continuous, high purity CO₂ flow at pressure (> 15 psia). The objective of this Phase I research is to develop a high capacity, regenerable CO₂ adsorbent that maintains its CO₂ capacity and mechanical integrity over extended adsorption/desorption cycles. We will optimize the sorbent formulation and conduct a minimum of 100 complete adsorption/regeneration cycles for our best sorbent formulation. We will carry out a design of the adsorbent-based CO₂ compressor and demonstrate the technical feasibility of the concept and quantify the logistics savings.

Primary U.S. Work Locations and Key Partners



Lightweight, Advanced Sorbent-Based Device to Collect and Pressurize CO₂ from Martian Atmospheres Project Image

Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Images	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

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Organizations Performing Work	Role	Type	Location
TDA Research, Inc.	Lead Organization	Industry	Wheat Ridge, Colorado
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Colorado	Ohio

Project Transitions

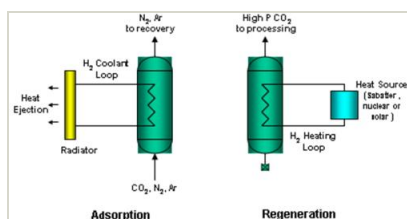
June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/137689>)

Images



Project Image

Lightweight, Advanced Sorbent-Based Device to Collect and Pressurize CO₂ from Martian Atmospheres Project Image (<https://techport.nasa.gov/image/125974>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

TDA Research, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

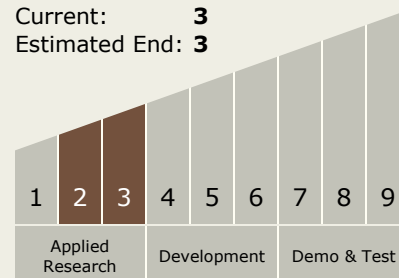
Carlos Torrez

Principal Investigator:

Ambalavanan Jayaraman

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX07 Exploration Destination Systems
 - └ TX07.1 In-Situ Resource Utilization
 - └ TX07.1.2 Resource Acquisition, Isolation, and Preparation

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System